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AUTHOR White, Karl R.
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ABSTRACT

Meta-analysis techniques for integrating research findings are utilized in this report to determine the magnitude of the relationship between socioeconomic status (SES) and academic achievement. Also investigated are the factors which contribute to the large amount of variance in previously reported correlations between these two variables. Over 100 studies yielding 636 correlation coefficients are included in the meta-analysis. Findings indicate that the relationship between SES and academic achievement is probably much weaker than many people have assumed. Findings also indicate that the variance in reported correlations between SES and academic achievement are due to the fact that most of the significant variables which influence the strength of the correlation are directly under the researcher's control. Recommendations concerning the most appropriate way of using measures of SES in future research applications are made. (Author/EB)

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The Relationship Between Socioeconomic Status and Academic Achievement

Karl R. White
Exceptional Child Center
Utah State University

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In summarizing the results of their now famous Equality of Educational Opportunity Survey (Coleman, Campbell, Hobson, McPartland, Mood, Weinfelt and York, 1966) Coleman and his associates concluded:

> Taking all of these results together, one implication stands out above all: that schools bring little influence to bear on a child's achievement that is independent of his background and general social context; and that this very lack of an independent effect means that the inequalities imposed on children by their home, neighborhood, and peer environment are carried along to become the inequalities with which they confront adult life at the end of school. (page 325)

For many educators, the Coleman Report confirmed what they thought they had known for years: that a strong relationship exists between all kinds of academic achievement variables and what has come to be known as socioeconomic status (SES). Indeed, the existence and strength of this relationship is so widely accepted that it is often cited as a self-evident fact. Statements such as the following are frequently made in scholarly writings with no further reference or supporting evidence.

> The family characteristic that is the most powerful predictor of school performance is socioeconomic status (SES): the higher the SES of the student's family, the higher his academic achievement. This relationship has been documented in countless studies and seems to hold no matter what measure of status is used (occupation of principal breadwinner, family income, parents' education, or some combination of these). (Boocock, 1971, page 32)

> To categorize youth according to the social class position of their parents is to order them on the extent of their participation and degree of success in the American Educational System. This has been so consistently confirmed by research that it can now be regarded as an empirical law .... SES predicts grades, achievement and intelligence test scores, retentions at grade level, course failures, truancy, suspensions from school, high school drop outs, plans for college attendence, and total amount of formal schooling (Charters, 1963, pp. 739, 740).

> One of the most consistent findings in educational measurement has been the relatively strong relationship between socioeconomic status (SES) and level of performance on most measures of mental abilities (Hennessy, 1976, page 1).

> The positive association between school completion, family socioeconomic status, and measured ability is well known (Welch, 1974, page 32).

In light of the belief that socioeconomic status (SES) and various measures of academic achievement are strongly correlated, it is not surprising that some measure of SES is frequently used by behavioral scientists in conducting research. After stating that the relationship between SES and "almost any type of school behavior" was so well documented that it "had become aximatic to social scientists," St. John (1970, page 255) concludes:

> "So powerful is the apparent effect of social class, that the influence of other background and school factors can be detected only if socioeconomic status (SES) is first neutralized through matching or statistical control. Accurate measurement of SES, therefore, is crucial to any social research in schools."

The most frequent applications of some measure of SES in conducting educational research are summarized below.

1. As a concommitant variable in an analysis of covariance, SES can be used in quasi-experimental studies to control for bias or correct for pre-treatment differences.

2. A measure of SES can be used to increase the precision of an experiment by using it as a stratifying variable or a covariate.

3. An SES variable can be used to investigate the presence of interaction effects (e.g. Does Method A work better with high SES student, while student Method B is more effective with low SES students?)

4. As a descriptive variable, SES can be used to define the populations which were included in the research. Such information can be important for replicating findings or generalizing the results of a study.

5. A measure of SES is sometimes used as a predictor variable. (e.g. In making admission decisions where only a limted number of resources are available, it might be important to know which students are most likely to be successful).

6. In investigating and trying to establish the validity of causal models, measures of SES are included as one of the causal agents of various educational outcomes.

In reviewing the literature, it is easy to find examples of studies in which a measure of SES has been used in one of these applications. In spite of the frequency of use and the widespread acceptence of SES as an appropriate tool in educational research, the utility of SES for the purposes described above depends on the

validity of that particular measure of SES and/or the strength of the relationship between SES and the educational variable of interest. A careful review of the available literature, however, reveals some disturbing and confusing facts about the relationship between SES and academic achievement.[1]

First of all, even though "everybody knows" what is meant by SES, a wide variety of variables are used as indicators of SES. Standard, widely accepted definitions of SES are difficult to find. Chapin (1928, page 99) defined socio-economic status as:

> ... the position that an individual or family occupies with reference to the prevailing average standards of cultural possessions, effective income, material possessions, and participation in group activity in the community.

The Michigan State Department of Education in conducting their statewide assessment defined SES very similarly (1971, page 5).

> "Student socioeconomic status is often thought to be a function of three major factors: 1) family income; 2) parents educational level; and parents' occupation."

Probably the best known, but by no means the most frequently used, measures of SES are the Index of Status Characteristics (Warner, Meeker, and Eells, 1949) and Hollingshead's Two-Factor Index of Social Position (Hollingshead and Redlich, 1957). The Index of Status Characteristics uses information about the family's 1) occupation of principal breadwinner; 2) source of income; 3) quality of housing; and 4) status of dwelling area to arrive at a score which is converted to one of five social classes. Hollingshead's scale, on the other hand, uses indices of occupation and educational attainment to categorize families into one of five social classes.

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[1] Throughout the remainder of this paper the term academic achievement will be used to refer to a broad range of educational outcome variables including scores on standardized achievement tests of various subject areas, class rank, grades, measures of IQ, etc. Later in the paper where a specific measure of academic achievement is intended, it will be clearly identified.

In reading the literature, however, one should be impressed, and somewhat concerned, by the range of variables used as measures of SES. Traditional indicators of occupation, education, and income are frequently represented. But one also finds frequent reference to such factors as size of family, educational aspirations, ethnicity, mobility, presence of reading materials in the home, and amount of travel, as well as school level variables such as teachers' salary, pupil/teacher ratio, per capita expense, and staff turnover. The implications of using such a variety of variables as indicators of SES will be discussed later in this paper. But the cautionary note made by Christopher Jencks and his colleagues (Jencks, Smith, Acland, Bane, Cohen, Gintis, Heyns, and Michelson, 1972, pp. 77,78) is a good reminder that things are not always what they are named.

> The term "family background" can itself be somewhat misleading, since differences between families derive not just from differences in home environment but from differences between neighborhoods, regions, schools, and all other experiences that are the same for children in the same family....Social scientists often use the terms "family background," "social class," and "economic status" almost interchangeably. We think this is a mistake....The way a family brings up its children is obviously influenced by its economic position. The extent of such influence is, however, a problem for investigation, not a matter of definition.

The second major concern raised by reading the literature concerns the strength of the relationship between SES and academic achievement.

It is not at all difficult to find studies which support the notion that there is a strong relationship between SES and measures of academic achievement. Klein (1971) reported data in which the estimated[2] correlation between SES and science achievement for elementary school students was .80. Levine, Stevenson, and

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[2]As will be discussed in more detail later in the paper, many studies which have examined the relationship between SES and academic achievement have not reported the results as correlation coefficients. Instead they have reported analysis of variance results, t tests, or non parametric statistics. In those cases where enough data were reported, it was possible to transform these results back into an estimate of the correlation coefficient. The exact techniques for accomplishing this will be discussed fully in the procedures section.

Mares (1973) found a correlation of .865 between a composite standardized achievement test scores and socioeconomics status among big city urban schools. Using Warner's Index of Status Characteristics, Baker, Shute, and Hinze (1961) reported a correlation of .680 with group IQ scores as measured by the California Test of Mental Maturity. Dunnell (1971) found a correlation of .755 between SES and Stanford Achievement Test scores among suburban elementary school students, and Thomas (1962) using Project Talent data for 206 secondary schools determined that a correlation of .852 existed between reading comprehension and SES.

On the other hand, it is also relatively easy to find moderate to very weak relationships reported between SES and academic achievement variables. Lambert (1970) reports a correlation of .434 between SES and scores on the Stanford Achievement Paragraph Reading Test for 300 first graders. Knief and Stroud (1959) found that SES correlated .340 with the composite score on the Iowa Test for Basic Skills for 344 fourth grade students. Fetter (1975) reported data from the National Longitudinal study of the class of 1972 in which SES correlated .263 with reading achievement and .284 with math achievement. The Health Services and Mental Health Administration of the Department of Health, Education, and Welfare (1971) reported a study of over 7,000 fourth graders in which SES correlated .480 with group IQ scores. Hennessy (1976) found a correlation of .136 between SES and a composite factor of verbal achievement summarized from the Comparative Guidance and Placement Program test battery, and Wright and Bean (1974) found that SES correlated .124, .089, and .072 with the verbal and quantitative scores on the Stanford Achievement Test and Grade Point Average, respectively.

It would not be surprising if a fairly extensive review of the literature which considers the relationship between SES and academic achievement leaves most readers somewhat confused. Frequently obtained correlations between SES and various measures of academic achievement range from .100 to .800. Although a number of reviews have been completed (Bryant, Glazer, Hansen, and

Kirsch, 1974; Cuff, 1933; Duncan, Featherman and Duncan, 1972; Findley and Bryan, 1970; Harighurst, 1961; Lavin, 1965; Loevinger, 1931; Neff, 1938) none of them provide an explanation of why so much variation in the magnitude of the correlation between SES and academic achievement exists in the published literature or what is the most reasonable estimate of the true or expected correlation between SES and academic achievement. Most of the available reviews cite the results of 10-20 studies and then spend the remainder of the review discussing issues such as the pros and cons of various ways of collecting SES information, the theoretical causal relationship of SES with other variables, the relationship of SES with such factors as ethnicity, intelligence, etc., or the inequities which result from an unequal distribution of SES characteristics among the general population. The reader is usually left with the evidence from a relatively small number of non randomly selected studies; or, sweeping generalizations such as those cited at the beginning of this paper as a basis from which to form a conclusion about the strength of the relationship between SES and academic achievement.

As noted earlier, the effectiveness of using a measure of SES for virtually all of the research applications for which it is typically used, depends heavily on the strength of the relationship between SES and academic achievement. Therefore, the purpose of this study is to conduct a thorough review of the literature which considers the relationship between SES and academic achievement in order to:

a) Establish the strength of the relationship which can be expected between typically used measures of SES and academic achievement.

b) Determine what factors contribute to the large amount of variance in the strength of previously reported SES • Achievement correlations.

c) Make recommendations about the most appropriate way of using measures of SES in future research applications.

Procedures

In order to determine the magnitude of the relationship between SES and academic achievement; and to investigate the factors which contribute to the large amounts of variance in previously reported correlations between these two variables, the meta-analysis techniques for integrating research findings proposed by Glass (1976) were utilized. Conducting a meta-analysis is relatively straight forward. Briefly summarized, it requires the reviewer to locate either all studies, or a sufficiently large representative sample of studies on a given topic, express the results of each study in a common metric and then quantify or code the various characteristics of each study that may have affected its results. Common statistical techniques such as correlation, multiple regression, and analysis of variance are used to study the association of these characteristics across all studies with variations in results. Since the results of all studies are expressed in a common metric, the most probable results of studies with given characteristics can also be estimated.

Identifying a Sample

A great deal of the research which has utilized measures of SES has done so in a secondary or tertiary role and, as a result, is not cited in the usual indexes, computer reference banks, or bibliographies as dealing with SES. For example, the results of an analysis of covariance (with SES as a covariate) in which two reading curricula are compared for differences in reading comprehension would probably not be identified in most hand, computerized, or branching bibliography literature searches. Consequently, most of the studies where SES was not one of the primary variables of interest were not identified for this analysis. The most probable effect of this sampling bias is that the studies included in the sample may have resulted in slightly higher estimates of the magnitude of the correlation between SES and academic achievement. The higher correlations would

result from the more careful and extensive measurement of the SES variable when it is of primary, rather than secondary importance.

Studies to be included in this analysis were identified using the Education Index, the Current Index to Journals in Education, ERIC (via a computerized search), Dissertation Abstracts International, and the bibliographies of studies already obtained. In all, 248 studies were identified for possible inclusion in the meta-analysis. The content of 63 of these studies was not appropriate for the topic being investigated. Of the remaining 183 articles, 40 dealt only with philosophical issues or instrument development, and 43 did not report correlation coefficients or sufficient information needed to calculate a satisfactory estimate of the correlation coefficient. Consequently, 100 studies were actually included in conducting the meta-analysis (those studies included in the meta-analysis are marked with an asterisk (**) in the references section).

Determining the Magnitude of the Correlation Coefficient

In most cases (71 out of the 100 studies) correlation coefficients were reported in the article. When no correlation coefficient was reported, every effort was made to include as many studies and to use as much information as possible in the meta-analysis. In studies which reported only t ratios, a point biserial correlation coefficient (r_{pbi}) was obtained by rearranging the following equation (see Glass and Stanley, 1970, page 318):

$$t^2 = r^2_{pbi} \frac{N-2}{1-r^2_{pbi}}$$

When the results of an analysis of variance were reported without the corresponding correlation coefficient, the intra-class correlation coefficient η was obtained by the following formula (see Hays, 1973, pages 683, 684).

$$\eta = \sqrt{\frac{SS_b}{SS_T}}$$

Since the Pearson product-moment correlation (r) is a measure of linear relation-

ship and η estimates curvilinear as well as linear relationship, η would tend to overestimate r in those cases where the relationship is not linear. The decision to use η as an estimate of r is consistent with the posture throughout the study to tend toward overestimation rather than underestimation in those cases where estimation is necessary.

Where an F ratio, but no analysis of variance table was reported, sums of squares (SS) could often be reconstructed and used in the above formula. In a few instances, it was necessary to reconstruct the actual F ratio from cell means and standard deviations.

When results were reported in a 2 x 2 contingency table, a tetrachoric correlation (r_{tet}) was estimated by using methods developed by Jenkins (1955). In four instances where the original contingency table was larger than a 2 x 2, r was estimated by collapsing the larger table into a 2 x 2 table for all possible combinations, computing r_{tet} for each one and taking the average as the final estimate of r. As pointed out earlier, there were 43 articles which examined the relationship between SES and achievement for which no correlation coefficient could be satisfactorily estimated.

Variables Coded for Each Study

Whether or not the meta-analysis is successful in explaining and summarizing the results of previous research depends largely on whether the proper variables are coded for each study. For example, a hypothetical explanation as to why so much variance exists in the magnitude of the correlation between SES and academic achievement might be that for very young children the correlation is very strong, but for older students the relationship disappears. By coding the age of the students used in each study and examining the correlation between age of students in the study and magnitude of the SES • Achievement correlation, the amount of the variance in previous research results which is accounted for by the age factor can be determined.

If, however, age is not coded for each study, most of the variance which is attributed to the age factor will probably remain unexplained.

There is no fail-safe technique for making sure that all of the proper variables are included in a meta-analysis. The selection of the variables to be included in this study was based on an extensive review of the literature, a pilot test of the coding instrument, and discussion with colleagues. The following variables were included:

a) The UNIT OF ANALYSIS used in computing the correlation coefficient was coded as aggregated, confounded or student. When an aggregated unit (such as school or district) was used, both the SES measure and the achievement measure were averages for the aggregated unit and the correlation was computed between these average scores. When the unit of analysis was confounded, SES was measured at an aggregated level and achievement was measured at the student level or vice versa. For instance, all students in the same school might be given the same SES rating, but could have individual achievement scores. The student was identified as the unit of analysis when both SES and achievement were measured at the student level.

b) TYPE OF ACHIEVEMENT measure was broken down into verbal, math, science, composite achievement, IQ and other.

c) GRADE LEVEL of the students used in the study. When a correlation was reported for combined grades, for instance grades 4 through 8, the average grade level was used.

d) SES REPORTING ERROR was coded "1" (no inaccuracy) to "4" (substantial inaccuracy) as an estimate of the potential inaccuracy of the information used as a measure of SES. For example, if education of parents was used as a measure of SES, it would be coded "1" if parents were interviewed, "2" if students reported it, "3" if teachers estimated it, and "4" if someone in the central office guessed at how various schools differed on this variable.

e) ACHIEVEMENT RANGE RESTRICTION was coded "1" (no restirction) to "4" (substantial restriction). An example of substantial restriction would be when the sample consisted only of children with an IQ of 130 or more.

f) SES RANGE RESTRICTION was coded "1" (no restriction) to "4" (substantial restriction). An example of substantial restriction would be when the sample consisted entirely of inner-city, low-income students.

g) PERCENT ETHNIC MINORITY was the percentage of students in the sample from an ethnic minority. This variable was given or could be estimated in only about two-thirds of the studies.

h) YEAR OF STUDY. When no year was reported for the actual study, the year of publication was used as an approximation.

i) NUMBER OF ITEMS IN THE SES INSTRUMENT.

j) NUMBER OF STUDENTS on which the correlation coefficient was based.

k) TYPE OF PUBLICATION where the information was reported was categorized by book, journals, and unpublished materials. The unpublished category consisted of dissertations, theses and reports (such as government contracts) which had to be published regardless of the findings.

l) SAMPLE was coded "1" for samples which were taken from a small geographic region and "2" for nationally representative samples. Almost all studies were done in the U.S. A few studies done in Canada and England were also included.

m) TYPE OF SES MEASURE. The factors in the following list were rated for each SES measure. Ratings were on a continuum from "0" (not represented in the instrument) to "3" (major representation in the instrument).

- income of family
- education of parents
- occupation of head of house
- home atmosphere (e.g. parents' attitude toward education, parents' aspirations for

their children, cultural and intellectual activities of the family.)

- dwelling value
- school resources
- pure judgment
- other (e.g. number of siblings, ethnicity and mobility of family.)

n) NUMBER OF SES GROUPS indicated how the SES variable was divided. For instance, students might be divided into two groups, low and high; or three groups, low, middle and high. Where the SES rating was a continuous variable, a value of "9" was assigned.

o) INTERNAL VALIDITY OF THE STUDY. This was coded "1" (high internal validity) to "3" (low internal validity). Examples of factors which contributed to a low internal validity are: using ethnicity as a measure of SES, only taking the two extreme groups to compute the correlation, and computing multiple t tests.

Results and Discussion

In total, 100 studies yielding 636 correlation coefficients, were included in the meta-analysis. Two of the primary objectives of the meta-analysis were to:

a) establish the strength of the relationship which can be expected between typically used measures of SES and academic achievement; and,

b) determine how much of the variance in the magnitude of previously reported correlations between SES and academic achievement can be accounted for by systematic differences among the studies.

By summarizing the results across all studies as well as partitioning the results of the different coding categories, a number of interesting facts can be learned about the relationship between SES and academic achievement. Collapsing across all coding variables reveals that the correlation coefficients for all studies form a somewhat skewed frequency distribution with a mean of .351, a median of .251, and a standard deviation of .225. These results, shown in Figure

1, indicate that for this sample of 100 studies the best estimate of the correlation between SES and academic achievement is only .251 (the median value of the distribution).

Figure 1.

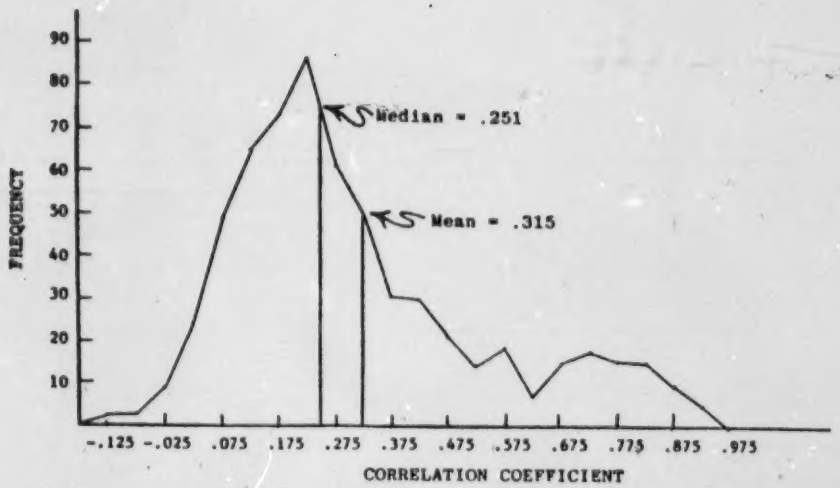

Figure 1

Frequency Distribution of SES • Achievement Correlation Coefficients for All Studies (N = 620)

This information indicates that the relationship between SES and academic achievement is probably much weaker than many people have assumed. Further information is necessary in order to be confident of that conclusion, and in order to understand what factors influence the magnitude of the correlation coefficient.

Data from the next level of analysis are presented in Table 1.

TABLE 1

MAGNITUDE OF THE MEAN CORRELATION BETWEEN SES AND ACHIEVEMENT AS DIFFERENT STUDY CHARACTERISTICS ARE ACCOUNTED FOR

		Unpartialed Correlations			Correlations Partialed on IQ		
		$\bar{x}$	S.D.	n	$\bar{x}$	S.D.	n
	ALL Correlations	.315	(.225)	(620)	.188	(.159)	(16)
UNIT OF ANALYSIS	Studies using AGGREGATED units of analysis	.680	(.184)	(93)			
	Studies using CONFOUNDED units of analysis	.338	(.152)	(39)			
	Studies using STUDENT as the unit of analysis	.245	(.160)	(489)	.152	(.107)	(14)
PUBLICATION TYPE	Studies reported in BOOKS	.308	(.277)	(88)			
	Studies reported in JOURNALS	.343	(.204)	(219)	.178	(.169)	(14)
	Studies reported in UNPUBLISHED material	.292	(.184)	(313)			
VALIDITY	VALID Studies	.296	(.220)	(489)	.157	(.105)	(14)
	FAIRLY VALID Studies	.357	(.218)	(107)			
	INVALID Studies	.486	(.251)	(28)			

Note. Categories where $n < 5$ have been omitted from the table.

These data indicate that the magnitude of the correlation is significantly related to a number of variables. Most dramatic are the differences in the magnitude of the correlation between SES and academic achievement when different units of analysis are used to compute the correlation. The differences between using students and aggregated units of analysis are graphically shown in Figures 2 and 3.

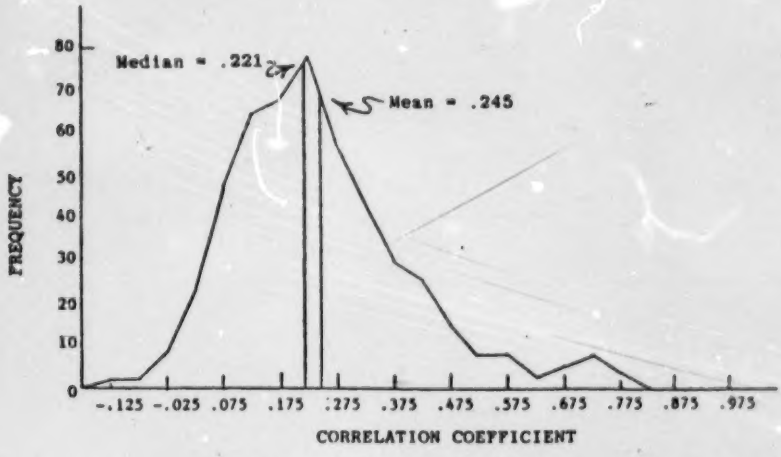

Figure 2

Frequency Distribution of SES · Achievement Correlation Coefficients for Studies Using the Student as the Unit of Analysis (N = 489)

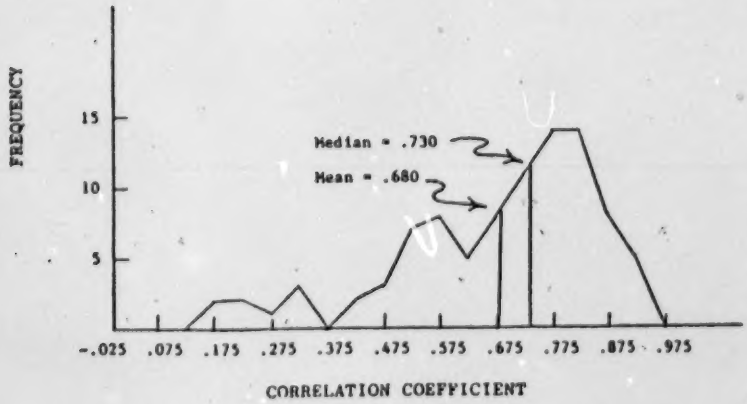

Figure 3

Frequency Distribution of SES · Achievement Correlation Coefficients for Studies Using Aggregated Units of Analysis (N = 93)

The effect of using aggregated units of analysis in computing correlation coefficients has been known among statisticians for some time (Robinson, 1950; and Knapp, 1977). Yet it is a fact frequently overlooked by most people in interpreting the results of research. Almost always, correlations computed from aggregated data will be much higher than correlations computed using individuals as the unit of analysis. As the data in Figures 2 and 3 so graphically demonstrate, the unit of analysis chosen by a researcher will have dramatic impact on whether SES is likely to be a very useful tool for most research applications.

Also evident in Table 1 is the sizeable decline in the magnitude of the mean correlation coefficient going from studies published in books ($r = .508$) to journals (.343) to unpublished material (.242). This evidence lends support to the common claim that the more prestigious outlets are publishing more than their share of Type I errors while a number of statistically insignificant, but possibly valid, findings go unpublished and consequently often unreported.

The results reported in Table 1 are consistent with the results reported in Table 2 when the confounding effect due to different units of analysis is eliminated.

TABLE 2

MAGNITUDE OF THE MEAN CORRELATION FOR LEVELS OF TYPE OF PUBLICATION AND VALIDITY OF STUDY WHEN THE STUDENT IS THE UNIT OF ANALYSIS

Category	SES • Achievement Correlation
All Correlations with Student as Unit of Analysis	.244 (n = 499)
Books	.312 (n = 165)
Journals	.253 (n = 38)
Unpublished	.204 (n = 286)
Valid	.234 (n = 414)
Fairly Valid	.296 (n = 71)
Invalid	.462 (n = 4)

In Table 3, the correlations between various study characteristics and the magnitude of the SES • Achievement correlation are shown. These are reported at two levels: first, using only those coefficients which were obtained using the student as the unit of analysis, and second, using all 620 coefficients.

TABLE 3

CORRELATIONS BETWEEN STUDY CHARACTERISTICS AND THE MAGNITUDE OF SES ACHIEVEMENT CORRELATION COEFFICIENTS

	Studies Using Student as the Unit of Analysis (n = 489)	All Studies (n = 620)
Grade Level	-.243	-.079
Reporting Error in SES 1 (low) 4 (high)	-.266	-.345
Range Restriction in Achievement 1 (low) 4 (high)	-.127	-.132
Range Restriction in SES 1 (low) 4 (high)	.130	-.071
Percent Ethnic Minority	-.301	-.317
Year of Study	-.131	-.012
Number of Items in SES Measure	.308	-.287
N of Study	-.144	-.174
Sample 1 (local) 2 (national)	-.232	-.225
Number of SES Groups	.013	.127
Study's Internal Validity 1 (high) 3 (low)	.178	.187

Most of the correlations in Table 3 are predictable from classical psychometric theory. When either or both of the achievement or SES measures are restricted in range, the mean correlation between the two is weakened. As reporting error in SES increases (connoting a drop in instrument reliability) the correlation

between SES and achievement is attenuated. And, as the number of items in the SES measure increases, indicating increased reliability due to a more adequate sampling of the SES construct, the magnitude of the correlation increases. In addition to confirming these expected results, other interesting information emerges. The correlation with year of study, paricularly when the student is the unit of analysis, indicates that a slight trend exists for more recent studies to find lower correlations. If true, and more research is needed to test these hypotheses, two explanations can be offered. First, it is possible that the increased availability to people of all SES levels of such things as television, movies, community groups and organizations, pre-school, etc.; and, secondly, the efforts of compensatory education; have had a positive effect in educing the strength of the relationship between SES and academic achievement.

In addition, when students were used as the unit of analysis, the correlation suggests that the relationship between SES and achievement drops off as students become older. A further test of this hypothesis is to examine the relationship between grade level and size of SES • Achievement correlation for just the data from the Equality of Educational Opportunity Survey (Coleman,et.al., 1960). The results, reported in Table 4 are illuminating because Coleman looked at four different grade levels using the same SES measures, the same kinds of achievement measures, and the same analyses techniques, thus eliminating many possible sources of error which would tend to attenuate the correlation coefficient.

TABLE 4

CORRELATIONS BETWEEN GRADE LEVEL
AND THE MAGNITUDE OF THE CORRELATION
BETWEEN SES AND ACHIEVEMENT USING ONLY COLEMAN'S DATA

	Verbal Achievement	Math Achievement	Both Math and Verbal Achievement
Grade 1	.212 (n = 20)	.217 (n = 20)	.214 (n = 20)
Grade 6	.207 (n = 20)	.209 (n = 20)	.208 (n = 20)
Grade 9	.176 (n = 20)	.161 (n = 20)	.168 (n = 40)
Grade 12	.175 (n = 20)	.131 (n = 20)	.153 (n = 40)

Note. Correlations for grade 3 are not reported because a different measure of SES was used.

The trend in Table 4, though slight, is clear and enhances the findings in Table 3. Two possible explanations should be considered. The first is that schools and other socializing agents are providing equalizing experiences and thus are reducing the relationship between SES and achievement as students grow older. The second, is that a disproportionate number of lower achieving students drop out of school in the higher grades, thus reducing the variance in achievement and correspondingly, the magnitude of the correlation. This second explanation is not entirely sufficient, however, since one would not expect this to occur until grade 9 or so when students reach the age when they are no longer required to attend school in most states. It seems plausible that parts of both hypotheses, and possibly others, are influencing the results.

At the next finer level of analysis, the average correlation between SES and various types of achievement measures was examined. This information is

reported in Table 5. As can be seen, the number of available correlations begins to be a problem and prevents definitive conclusions in some instances. Values which were based on less than ten correlations have been deleted from the table.

TABLE 5

AVERAGE CORRELATIONS BETWEEN SES AND ACHIEVEMENT FOR DIFFERENT KINDS OF ACHIEVEMENT MEASURES

		Verbal $\bar{x}$	Verbal S.D.	Math $\bar{x}$	Math S.D.	Composite Achievement $\bar{x}$	Composite Achievement S.D.	G.P.A. All Subjects $\bar{x}$	G.P.A. All Subjects S.D.	IQ $\bar{x}$	IQ S.D.
	ALL	.307 (225)		.246 (143)		.369 (66)		.256 (47)		.403 (102)	
UNIT OF ANALYSIS	STUDENT	.234 (174)		.197 (128)		.270 (46)		.236 (41)		.333 (74)	
	CONFOUNDED	.294 (16)								.337 (10)	
	AGGREGATED	.676 (35)		.697 (14)		.636 (15)				.731 (18)	
TYPE OF PUBLICATION	BOOK	.447 (40)				.616 (10)				.592 (19)	
	JOURNAL	.354 (49)		.382 (18)		.293 (42)		.235 (30)		.387 (63)	
	UNPUBLISHED	.248 (136)		.210 (117)		.420 (14)		.292 (17)		.273 (20)	
STUDY'S VALIDITY	VALID	.288 (174)		.194 (128)				.252 (43)		.419 (81)	
	FAIRLY VALID	.368 (42)		.290 (10)		.297 (48)				.306 (17)	
	INVALID					.523 (11)					

With a few minor exceptions, which are probably attributable to small sample size, the results in Table 5 support the interpretations made from the data in Table 1. In addition, information is provided about the size of the correlation for different types of achievement measures. The most meaningful

category to examine is where the student was used as the unit of analysis and all other variables were collapsed. Correlations with verbal achievement tended to be slightly higher than those with math scores. Values for GPA (which may have problems with instrumentation) were somewhat lower (.256) than for composite achievement (.369); and, the value for IQ (.403), was noticeably higher than any of the others. Even though the differences in each case are slight, this evidence suggests that the correlation of SES with achievement is generally higher with verbal measures than with math measures. This might possibly be attributed to the fact that most math skills are learned at school, while a good deal of verbal skills are learned in the home. Consequently, the characteristics of the home would understandably exert a stronger influence on verbal learning.

The next step in the meta-analysis was to examine the magnitude of the correlation between SES and achievement depending on the makeup of the SES instrument. Studies were divided into eight categories representing the kind of indicators which had been used for SES. The mean magnitude of the correlation is shown in Table 6 for studies which used an aggregated and those which used a student unit of analysis (confounded units of analysis are not reported because of small sample sizes). Again, the number of correlation coefficients included in some categories make these results somewhat tenuous.

Among the traditional measures of SES (income, education, and occupation), income is the highest single correlate of academic achievement. It is also evident that measures of SES which combine two or more indicators are better predictors than any single indicator. More striking, however, is the fact that measures of home atmosphere correlated much higher with academic achievement than any single or combined group of the traditional indicators of SES. Extending the comments by Jencks, et. al. (1972) cited earlier, there are many more potential differences among families that can potentially impact on the academic achievement of the children than differences in education, occupational level and income of the parents. It is

not at all implausible that some low SES parents are very good at creating a home atmosphere that fosters learning (i.e. read to their children, help them with their homework, encourage them to go to college, take them to the library and cultural events, etc.) where other low SES parents do not.

TABLE 6

MAGNITUDE OF THE MEAN CORRELATION BETWEEN SES AND ACHIEVEMENT FOR DIFFERENT KINDS OF SES MEASURES

SES Measure Consists of Indicators of	Student	Aggregated	SES Measure Consists of Indicators of	Student	Aggregated
INCOME (only)	.315 (19)	.767 (18)	INCOME and EDUCATION	.230 (36)	
EDUCATION (only)	.185 (116)	.686 (8)	INCOME and OCCUPATION	.332 (15)	
OCCUPATION (only)	.201 (65)	.586 (9)	EDUCATION and OCCUPATION	.328 (20)	
HOME ATMOSPHERE (only)	.577 (21)		INCOME, EDUCATION and OCCUPATION	.318 (27)	.544 (8)
SCHOOL RESOURCES (only)		.619 (28)	INCOME, EDUCATION and OCCUPATION plus something else major[a]	.365 (22)	.789 (12)

[a]This was either a measure of home atmosphere, school resources or some non-SES indicator such as ethnicity.

However, a complete interpretation of the fact that measures of home atmosphere in this analysis account for four to eleven times as much of the variation in academic achievement as do traditional measures of SES is fraught with problems of third variables and directionality. For instance, is the high correlation between home atmosphere and achievement because children do better in school if their parents help them with their homework and encourage them to go to college; or, is it because parents start helping their children and taking an interest in their education because of the child's previous success in school? In other words,

does home atmosphere cause the child's academic success, or does a child's academic success create a certain kind of home atmosphere? Either explanation or some combination of the two could be true.

Obviously, a sizeable difference exists in the mean magnitude of the correlation with achievement for home atmosphere and traditional measures SES. This suggests the worth of testing the hypothesis that SES, as it traditionally has been defined, is not the most correct variable for most of the applications for which it has been used. This, in turn would raise serious questions about the conclusions which have resulted from the use of SES in the past. Even though family background does have a strong relationship with achievement, it may be how parents raise their children (i.e., do they read to their children, take them to the library, encourage them in school, help them with their homework, etc.), not the parents' occupation, income or education which really make the difference. Since income, education and occupation do correlate with these other variables to some extent, a correlation may exist between SES (income, education and occupation) and achievement, when the real variable of interest may be home atmosphere.

Unfortunately, the question can not really be answered from data reported in Table 6. As mentioned, problems of directionality, third varibles, etc. exist in trying to establish causality; in addition to questions about the appropriate techniques for measuring home atmosphere. To date, only a few studies have been completed, but the results of these studies, as summarized in Table 6, suggest plausible and important hypotheses in need of additional refinement and testing.

The final step in the meta-analysis was to determine what percent of the variation in the magnitude of the correlation between SES and academic achievement could be accounted for by the characteristics of the studies. This was done using the coding variables of each study as predictors in a multiple regression equation to predict the magnitude of the correlation coefficient. The results are shown in Table 7 for four different multiple regression equations.

TABLE 7

AMOUNT OF VARIANCE IN THE MAGNITUDE OF THE SES·ACHIEVEMENT CORRELATION WHICH CAN BE PREDICTED BY STUDY CHARACTERISTICS

	Magnitude of r Predicted by																
	Unit of Analysis	Type of Achievement Measure	Grade Level	SES Reporting Error	Achievement Restriction	SES Restriction	Ethnicity	Year of Study	Number of SES Items	N of Study	Type of Publication	Sample Type	Type of SES Measure	Number of SES Groups	Validity of Study	Multiple R	R^2	Corrected R^2
All other study characteristics	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	.875	.765	.745
Those characteristics which are under the researcher's control	*	*	*	*	*	*			*	*			*	*	*	.799	.638	.623
Those characteristics which are under the researcher's control except for unit of Analysis		*	*	*	*	*			*	*			*	*	*	.603	.364	.334
Type of SES Measure													*			.554	.307	.294

As can be seen almost 75% of the variance in r's can be accounted for by the characteristics coded for each study. Well over half of the variation in r's is accounted for by characteristics which are completely under the control of the researcher, and more than one-quarter of the variance can be explained by the type of SES measure which is used.

Two other problems in interpreting the strength of the relationship between SES and academic achievement were discovered in conducting the meta-analysis. The first problem is the way in which results of studies are reported. Of 143 studies which examined the relationship between SES and academic achievement, which were originally identified for inclusion in the meta-analysis, only about half of them reported the relationship as a correlation coefficient. A summary of how results were reported is shown in Table 8.

TABLE 8

HOW RESULTS OF RELATIONSHIPS BETWEEN SES AND ACHIEVEMENT WERE REPORTED IN 143 STUDIES

Frequency	Method of Reporting
37	Reported differences between groups using t or F statistics
27	Visually inspected results and concluded that differences existed
8	Reported chi squared or non-parametric statistics
71	Reported correlational coefficients
143 Total	

When the results of studies which examine the relationship between SES and academic achievement are reported as correlation coefficients it is a simple matter to interpret the strength of the relationship and to compare the results with those of other studies. Of course, there is nothing inherently wrong with reporting main effects, means, or nonparametric statistics, but such statistics are less informative and can even be misleading about the strength of the relationship between SES and academic achievement. When N's are fairly large, a factor need only be minimally related to the dependent variable to show highly statistically significant analysis of variance main effects. For instance, if 500 students were divided into two SES categories, high and low, there would be a statistically significant difference between the levels of SES at the $\alpha = .05$ level if it were correlated with the dependent variable (e.g., achievement test scores) at $r = 0.10$. This would mean that only 1% of the total variance in achievement scores could be predicted from knowing the SES of the students and 99% would remain unaccounted for! Similar, but even more serious problems in interpreting the strength of the relationship results when non-parametric statistics are used or when results are only visually inspected without the aid of statistical techniques.

The second problem, which has been alluded to earlier in the paper, concerns the wide range of very different variables which are used as indicators of SES. In the absence of a widely accepted and precise definition of SES, this is not a surprising phenomenon. Nonetheless, the almost indiscriminate inclusion of whatever pleases a particular researcher as a measure of SES seriously weakens its validity as a research tool. In the 143 studies identified for inclusion in this meta-analysis, over 70 different variables were used (either alone or in some combination) as indicators of SES. Table 9 combines these variables into 43 categories and reports the number of studies in which each was used.

TABLE 9

VARIABLES USED AS INDICATORS OF SES AND THEIR FREQUENCY OF USE

	Variable	Frequency
TRADITIONAL SES	Occupation of Parents	88
	Education of Parents	57
	Income of Family	47
	Dwelling Quality	39
	Possessions in the Home	17
	Frequency of Dental Work	6
	Recipients of Welfare	4
	Have Servants	7
	Travel	2
HOME ATMOSPHERE	Academic Guidance in the Home	4
	Work Habits and Democracy in the Home	5
	Family's Attitude toward Education	9
	Quality of Language in the Home	6
	Achievement Motivation of Child	2
	Church Attendance	2
	Reading Materials in the Home	14
	Family Stability	10
	Aspirations of Parents for Child	11
	Amount of Cultural Activities in which Family Participates	15
	Conversation in the Home	4
SCHOOL RESOURCES	Age of Building	2
	Salary of Teachers	4
	Experience of Teachers	2
	Size and Type of Community	3
	Size of District	2
	Average Absenteeism	1
	Number of Books in Library	2
	Presence of Guidance Program	1
	Pupil Teacher Ratio	2
	Percent of Teachers with MA's	4
	State Valuation Per Pupil	2
	Instructional Expense Per Pupil	6
	Amount of Federal Funds Received by School	2
	Staff Turnover	3
	Presence of College Prep Program	2
	Percent of Last Year's Students Who Went to College	1
MISCELLANEOUS	Number of Siblings	10
	Pure Judgment with No Objective Criterion	18
	Population Density	4
	Ethnicity	4
	Mobility	4
	Country of Parents' Birth	2
	Not Reported	6

Conclusions and Recommendations

At the beginning of this paper, six different situations were identified in which measures of SES were frequently used in educational research in conjunction with measures of academic achievement. Briefly reviewed, these situations include using a measure of SES as:

1) a concommitant variable in adjusting for bias or pre-treatment differences among groups

2) a covariate or stratifying variable to increase the precision of an experiment

3) a stratifying variable to investigate the effect of interactions with other independent variables.

4) a descriptive variable in order to allow others to replicate findings or generalize results

5) a predictor variable

6) a causal agent

The utility and wisdom of using SES in conjunction with academic achievement depends largely on the validity of the particular measure of SES and/or the strength of the relationship of that measure of SES with academic achievement. By conducting a meta-analysis of the previously completed research in which the relationship between SES and academic achievement had been examined, the objectives of this study were to:

1) Establish the strength of the relationship which can be expected between typically used measures of SES and academic achievement.

2) Determine what factors contribute to the large amount of variance in the strength of previously reported SES • Achievement correlations.

3) Make recommendations about the most appropriate way of using measures of SES in future research applications.

In accomplishing these objectives the results of the meta-analysis are enlightening and provocative. The analysis is enlightening because it provides significant new information about the strength of the relationship between SES and academic achievement, as well as explaining much of the cause for such large

amounts of variance in the previous finding. In addition to organizing and making sense of previous research findings, the results of the analysis are provocative because a number of hypotheses are suggested which could be confirmed or rejected by future research.

The Strength of the Relationship Between SES and Academic Achievement

Based on the data presented in these analyses, it can be concluded that as it is most frequently used (with the student as the unit of analysis), and traditionally defined (using one or more indicators of parents' income, educational attainment or occupational level) SES is positively, but only weakly correlated with measures of academic achievement. In such situations, measures of SES can be expected to account for less than 5% of the variance in students' academic achievement. Correlations of that magnitude seriously restrict the utility of SES in most of the research applications identified above.

The widespread, but apparently false conclusion, among many educators, that a strong relationship between SES and academic achievement "has been documented in countless studies" (Boocock, 1971, page 32), is also at least partially explained from the results of the meta-analysis. First of all, in those cases where an aggregated unit of analysis is appropriate for the questions in which the researcher is most interested, SES and academic achievement do appear to be strongly correlated. It must be remembered, however, that the strength of this relationship cannot and should not be generalized to situations where the student is the unit of analysis. When the student is the unit of analysis, SES and academic achievement are only weakly correlated.

Secondly, the way in which SES is defined is of critical importance in determining the strength of the relationship between SES and academic achievement. As pointed out by the results of the meta-analysis, some of the measures which are used as indicators of SES, or which other educators might consider a measure of SES (e.g. measures of home atmosphere) are much more strongly related to academic

achievement than are traditional indicators of SES.

Finally, the way in which results of studies are frequently reported is probably in part responsible for creating the impression that SES and academic achievement are strongly correlated. Statistically significant findings in studies which use an SES factor in computing an analysis of variance, t test or chi squared analysis, have probably mislead many educators about the strength of the relationship between SES and academic achievement.

Explaining the Variation in Previous Findings

As noted near the beginning of this paper, one of the most confusing things about reviewing the literature which examines the relationship between SES and academic achievement, is the wide range in the strength of the relationship between SES and academic achievement. Frequently reported correlations range from .100 to .800. From the results of the meta-analysis it is clear that the unit of analysis used in computing the correlation coefficient and the definition of SES which is used, are important variables in explaining this large amount of variation. Many of the other variables (e.g. grade level, year of study, type of achievement measure, etc.) included in the meta-analysis were also significant contributors to the explanation of variation in previous results. Almost 75% of the variation in previously reported correlations between SES and academic achievement was explained by the factors coded for each study. The importance of this finding is not only the large amount of variance which can be explained, but also the fact that many of the most significant variables which influence the strength of the correlation are directly under the researcher's control.

Using Measures of SES as a Research Tool

The results of the meta-analysis indicate clearly that when the student is the unit of analysis and traditional measures of SES are used, there is very little purpose in using a measure of SES as a covariate, stratifying variable, predictor, descriptive variable or causal agent in studies dealing with academic achievement. The ineffectiveness of SES in these applications is due to the weak correlation between SES and academic achievement.

When schools or other aggregated groups are the appropriate unit of analysis, traditional measures of SES are usually correlated strongly enough with academic achievement measures to be useful as a covariate, predictor,or stratifying variable. It must be remembered, however, that this is only appropriate in those relatively infrequent situations where grouped data will answer the questions in which the researcher is interested. In such situations the researcher should be particularly careful to specify that grouped data were used and that the magnitude of obtained correlations is much higher than would normally be expected when individuals are the unit of analysis.

The validity of using SES • Achievement correlations based on aggregated units of analysis in building causal models, such as path analysis, is less clear, since the causal effect of SES probably impacts more on individuals than on groups. Consequently, it is probably more appropriate to use data which have used the student as the unit of analysis, in building causal models.

The final recommendation for using SES as a research tool in conjunction with measures of academic achievement concerns the definition of SES. From reviewing the research, it seems that SES has become a convenient label to attach to a variety of different combinations of variables. A significant amount of confusion could be avoided if a distinct, widely accepted definition of SES existed. In the absence of such a definition, researchers would be well advised to avoid using the term "SES"

as much as possible. Alternative labels such as family income, occupation of the head of the home, school resources, expenditure per pupil or home atmosphere, with a precise definition of how the variable was measured, would do much to clarify the results of future research.

Suggestions for Future Research

Integrating and summarizing the results of previously completed research on a given topic often focuses attention on additional questions in need of further research, as well as providing answers to the study's original objectives. The results of this study suggest a number of tentative hypotheses which need to be tested by further research. For example, what is the causal relationship, if any, between home atmosphere and achievement; why is there a difference in the magnitude of the correlation between SES and verbal achievement, and SES and math achievement; have publishing policies of journals (either implicit or explicit) led to an over representation of Type I errors in the published literature; and to what can we attribute the decline in the SES • Achievement correlation from lower to higher grades or over time? The results of the meta-analysis offers some information about each of these questions, but more research is needed before confident conclusions can be drawn.

In summary though, the results of the meta-analysis do allow confident conclusions about a number of important points. First of all, the expected strength of the relationship between traditional measures of SES and academic achievement when individuals are the unit of analysis is much weaker than has frequently been assumed. The relationship is so weak as to make traditional measures of SES essentially worthless as a research tool in conjunction with academic achievement. And finally, most of the variance in previously reported research can be accounted for by the systematic differences among studies. This information does much to clarify our understanding and should prove useful in guiding future research and educational practice concerning the relationship between SES and academic achievement.

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[3]The list of references will depart slightly from traditional format in order to indicate those articles which were examined for the meta-analysis. Articles which were examined but not used are preceded by a single asterisk (*). Each of the 100 articles actually used in the meta-analysis is preceded by a double asterisk (**).

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